

A REDESCRIPTION OF *MICROCYCLOPS CEIBAENSIS*
(MARSH, 1919) (COPEPODA: CYCLOPOIDA) FROM
MARSH'S SPECIMENS IN THE NATIONAL
MUSEUM OF NATURAL HISTORY

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Abstract.—The neotropical freshwater cyclopoid copepod species *Microcyclops ceibaensis* (Marsh, 1919) is redescribed from specimens from the type locality, deposited by Marsh in the National Museum of Natural History. *Microcyclops diversus* Kiefer, 1935, is a synonym. Locality records include Brazil, Costa Rica, Cuba, Haiti, Honduras, Uruguay, Venezuela, and possibly Mexico.

Species of the freshwater cyclopoid copepod genus *Microcyclops* may be distinguished by a complex of microcharacters. Because many characters now recognized to have taxonomic utility were not reported by earlier workers, and because some characters may be given different weight by contemporary investigators, assignment of specimens to particular species is still a tenuous business.

Marsh (1919) described *Cyclops ceibaensis* from a collection made at La Ceiba, Honduras, by F. J. Dyer. This species is now assigned to the genus *Microcyclops* Kiefer, 1929a. Some confusion has resulted from inadequacies in Marsh's original description: Kiefer (1929b) tentatively synonymized *C. ceibaensis* with *Microcyclops varicans* (O. Sars, 1863), an opinion shared by Gurney (1933). On the basis of broader experience with the range of variation within *M. varicans*, Kiefer later (1936) came to consider *M. ceibaensis* as a valid species and suggested that *M. diversus*, described by him from Uruguay (1935) might be a synonym of *ceibaensis*. Lindberg placed *M. ceibaensis* as "species incertae sedis" in his list of Cyclopoida from Central America and Mexico (1954b), though he later included it in a key to the genus (1957a). Smith and Fernando (1978) presented figures of a Cuban species which they attributed to *M. ceibaensis*, and commented that *M. diversus* is probably a

synonym of the former species. On the other hand, Dussart (1984 and personal communication to the author) is of the opinion that *M. diversus* and *M. ceibaensis* are distinct species.

Marsh stated (1919) that the type specimen of *M. ceibaensis* had been "catalogued under No. 57392 in the collection of the United States National Museum." This number is not traceable, and a careful search of the collections has failed to locate the type. However, several other specimens from the type locality, collected during the same period as the type, were found in the Marsh Collection of slides of Copepoda. The condition of the original slides permits a more extensive description than that furnished by Marsh. I here redescribe these specimens and compare them to closely related forms. Marsh (1919) designated no paratypic specimens. Since, however, his comments and unpublished notes make it clear that his observations of the specimens described in the present article were used in part for the original description, they may be considered to be paratypes.

Microcyclops ceibaensis (Marsh, 1919)
Figs. 1–11

Cyclops ceibaensis Marsh, 1919:546–547,
figs. 1–5. (Honduras).

Cyclops ceibaensis.—Kiefer, 1929a:36–37,

40; 1936:295–296.—Lindberg, 1954b: 486, 488.

Cyclops varicans (part).—Gurney, 1933:255.

Cyclops (Microcyclops) varicans (part).—Kiefer, 1929b:66; 1929a:36–37, 40.

Microcyclops varicans (part).—Comita, 1951:372.

Microcyclops diversus Kiefer, 1935:186–187, figs. 10–13. (Uruguay).—Brehm, 1935:298–299, 305. (Uruguay).—Collado et al., 1984:94–97, figs. 26–28. (Costa Rica).—Dussart, 1984:41, 43, 57, fig. 18. (Venezuela).—Herbst, 1959:70.—Lindberg, 1954a:214–216; 1954b:486–488; 1957a:168; 1957b:39.—Löfller, 1958:21; 1963:215; 1981:16.—Smith and Fernando, 1978:2020.

Cyclops (Microcyclops) cf. diversus und ceibaënsis.—Kiefer, 1936:265, 267, 295–296, figs. 68–70. (Haiti).

Microcyclops ceibaënsis.—Lindberg, 1954b: 488; 1957a:168.—Osorio Tafall, 1941: 343. (Mexico).—Smith and Fernando, 1978:2020, figs. 30–32. (Cuba); 1980:11, 18, figs. 7G–7I. (Cuba).

Cyclops (Microcyclops) spec.—Herbst, 1959: 70–71, fig. 42. (Brazil).

non *Microcyclops diversus*.—Harding, 1955: 243, figs. 68–69. (Peru).

non *Cyclops (Microcyclops) varicans*.—Herbst, 1959:65–66, figs. 29–31. (Brazil).

Material examined.—Honduras, La Ceiba, all dissected on slides, stained, and mounted in glycerine jelly: USNM 222298, 1 female (Marsh's No. 4259, labelled "eggbearing"), collected 19 Mar 1916; USNM 222299, 2 females (Marsh's Nos. 4277 and 4280, labelled "eggbearing") and 1 female (Marsh's No. 4283), collected 27 Sep 1916. All are labelled "*C. cubanensis*" on the slides but "*Cyclops ceibaënsis*" in Marsh's card file, and correspond to the description of *C. ceibaënsis*. Marsh does not indicate whether collections were made from one or several ponds.

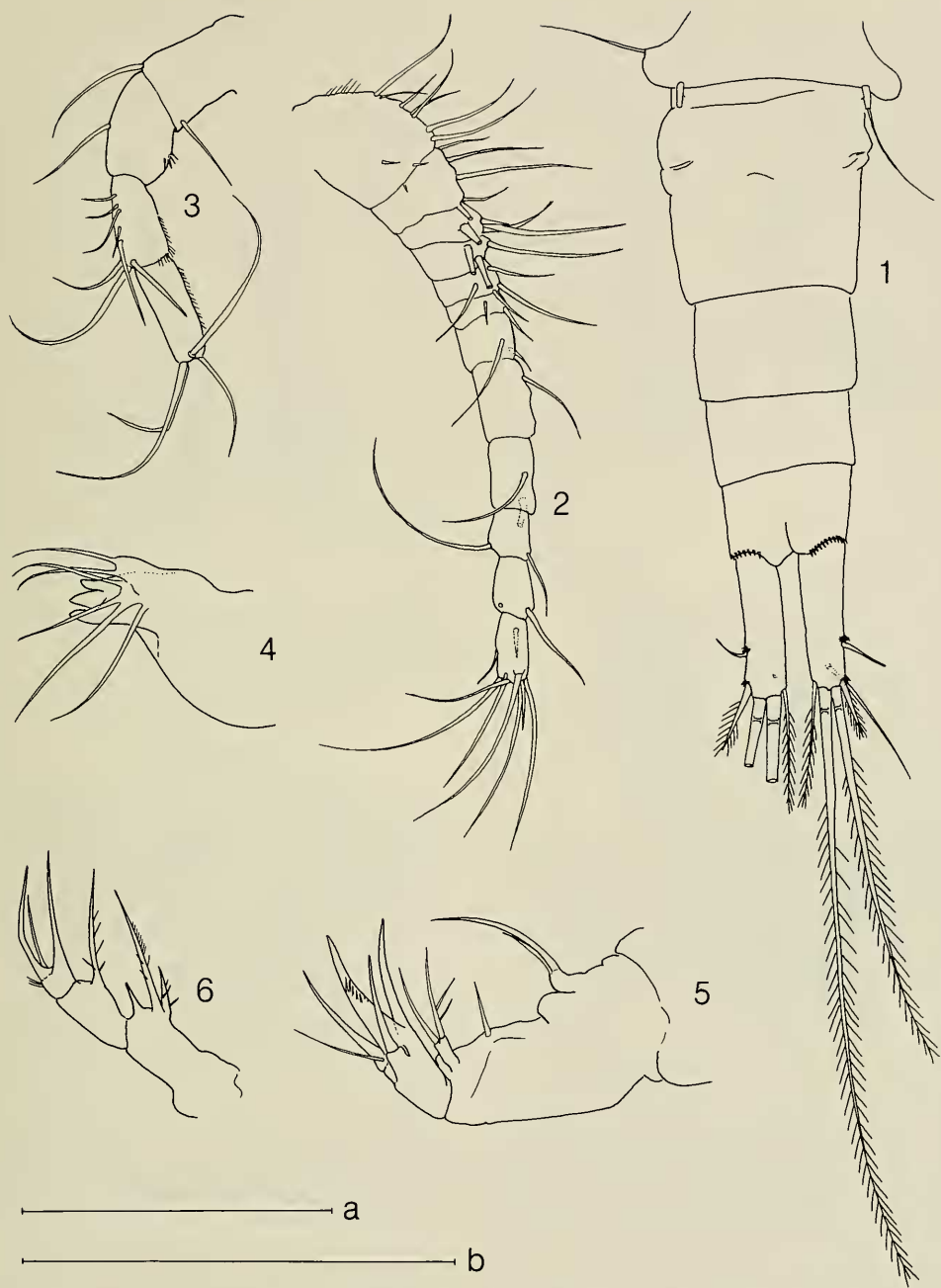
Slides numbered 4281 and 4282, also indicated in the card file as being *C. ceibaën-*

sis, are not present in the collection. Although No. 4277 was labelled "ant. abd. ft.", only the antennule and antenna can now be located on the slide. Two copepodites (Marsh's Nos. 4278 and 4284) were also listed in Marsh's card file under *C. ceibaënsis*, but labelled only as "*Cyclops*" on the slides. No. 4278 is partly dissected and the abdomen cannot be located on the slide. The caudal rami of specimen No. 4284, which is mounted whole, are very short. Since both are early copepodite stages (II or III), they cannot with certainty be assigned to *M. ceibaënsis*.

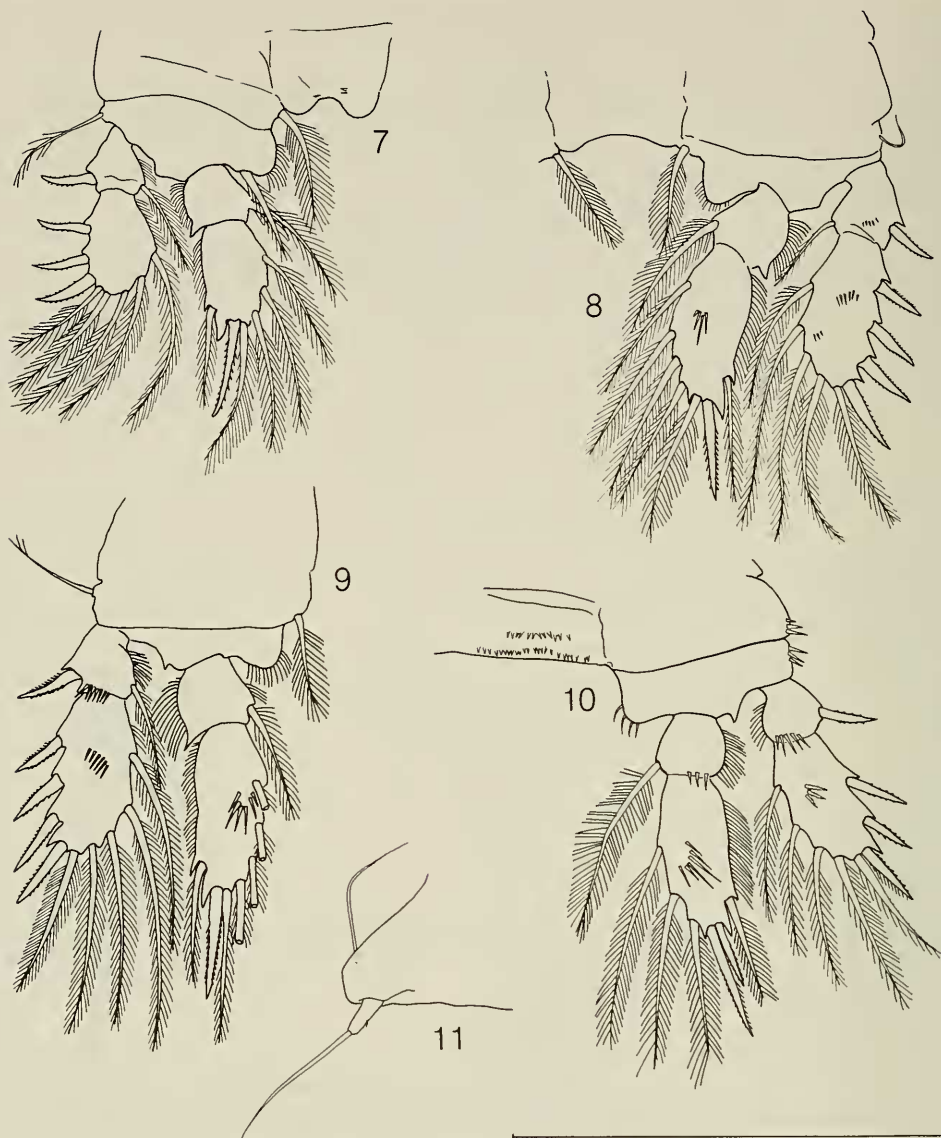
Slide No. 4280 contains the most complete specimen, which was used for the present diagnosis and figures. The slide contains, dissected: cephalothorax with antenna and some mouthparts attached; both antennules, separated; 1 maxilla; 1 maxilliped; legs 1, paired, having 3 external spines on exopod segment 2; 1 pair of legs having 4 external spines on exopod segment 2; 1 isolated leg with 3 external spines on exopod segment 2; 1 right and 1 left leg, attached one above the other, with 4 and 3 external spines on exopod segment 2 respectively; and abdomen with legs 5.

Since 1 pair and 1 other leg (not leg 1) have 4 external spines on exopod segment 2, the spine formula of 3,3,4,3 given by Marsh for *M. ceibaënsis* is impossible. Marsh's notes several times indicate confusion (which will be understood by anyone who has dissected a small copepod!) as to the dissections and therefore the armature of the swimming legs. The true spine formula is then 3,4,4,3, which is normal for the genus. The formula of 3,4,4,3 was also given by Smith and Fernando (1978) for Cuban specimens ascribed to *M. ceibaënsis*. Assuming that Marsh dissected legs 3 and 4 together, a conclusion supported by the 2 strong terminal spines on endopod 2 of the supposed leg 4, the pair of legs with 4 external spines on exopod 2 are therefore legs 2, and all 4 legs can be figured.

Female.—Abdomen (Fig. 1) of 4 segments, length 193 μ m. Anterior third of gen-



Figs. 1-6. *Microcyclops ceibaensis*, Marsh's No. 4280, eggbearing female, La Ceiba, Honduras: 1, Abdomen and legs 5, ventral; 2, Antennule; 3, Antenna; 4, Maxillula; 5, Maxilla; 6, Maxilliped. Scale a, Fig. 1; scale b, Figs. 2-6; scales = 100 μ m.



Figs. 7-11. *Microcyclops ceibaensis*; Figs. 7-10, Marsh's No. 4280, eggbearing female, La Ceiba, Honduras: 7, Leg 1; 8, Leg 2; 9, Leg 3; 10, Leg 4. Fig. 11, Marsh's No. 4259, female, La Ceiba, Honduras, Leg 5. Scale = 100 μ m.

ital somite broadened, greatest width about equal to length; shape of seminal receptacle not distinguishable. Anal somite with spinules on posteroventral border. Caudal rami about $3.8\times$ longer than broad, bearing 4-5 spinules anterior to insertions of lateral and outer subterminal setae; lateral seta inserted

at posterior fifth of ramus. Inner margins of rami smooth. Relative lengths of caudal setae as in Fig. 1 and Table 1.

Antennule (Fig. 2) shorter than cephalothorax, of 12 articles; no hyaline lamella distinguishable on terminal articles. Antenna, maxillula, maxilla and maxilliped as in

Figs. 3–6 respectively. Mandible not examined. Legs 1–4 (Figs. 7–10 respectively) with endopods and exopods of 2 articles; spine formula 3,4,4,3. Inner extension of basipod 2 of leg 1 with strong spine. Connecting lamellae of legs 1–3 without conspicuous ornamentation; lamella of leg 4 with 2 parallel rows of spinules on anterior surface. Exopods 2 of legs 2–4 each with group of 3–6 spinules on anterior surface. Endopod 2 of leg 4 about 2× longer than broad; inner terminal spine about 1.6× longer than outer (Table 1). Free article of leg 5 (Figs. 1, 11) slightly tapering distally, about 3.5× longer than broad, with minute spinule at midlength of inner margin and 1 long smooth terminal seta. 1 long seta inserted anterolaterally to free article of leg 5. Leg 6 not visible.

Comparative measurements of Marsh’s 3 most complete specimens appear in Table 1. The seminal receptacle and leg 6 are not visible on these specimens.

Discussion

A. The synonymy of *Microcyclops ceibaensis* (Marsh) and *M. diversus* (Kiefer): Kiefer (1935) cited as diagnostic features of *M. diversus* the length/width ratios of the caudal ramus and of the endopod 2 of leg 4; the proportions of the terminal spines of the latter article; leg 5 with its “kleines, aber gut ausgeprägtes Dörnchen”; and the shape of the seminal receptacle. He also noted two horizontal rows of spinules on the connecting lamella of leg 4. As may be seen from Tables 1 and 2, the reported ranges of variation in total length and proportions of caudal rami and 4th legs for most characters of *M. diversus* are similar to those of *M. ceibaensis*. The proportions of leg 5, with its tiny spinule on the inner ventral margin, the spinules on the anterior surface of leg 4 endopod 2, and the two parallel rows of spinules on the anterior surface of the basal lamella of leg 4 are also features shared by both species. Kiefer later (1936) commented on several similarities between *M.*

Table 1.—Measurements from Marsh’s specimens of *Microcyclops ceibaensis*, deposited in the National Museum of Natural History. Abbreviations: CR, caudal ramus; P4, leg 4; enp2, second (terminal) article of endopod. *Indicates specimen turned slightly laterally.

Specimen no.	4280	4259	4283
Cephalothorax, length	330 μm	—	—
Abdomen, length	193	296	296
Genital segment, length	90	90	94
Genital segment, width	90	90	100
CR, length	73	96*	76
CR, width	19	17*	20*
Antennule, length	220	215	—
P4 enp2, length	50	55	54
P4 enp2, width	24	24	23
P4 enp2, outer terminal spine	24	23	23
P4 enp2, inner terminal spine	40	40	36
CR, setae: Lateral	20	18	15
Dorsal	73	42	65
Inner terminal	55	48	50
Inner median terminal	275	300	280
Outer median terminal	173	180	165
Outer terminal	31	29	28

diversus and *M. ceibaensis*, but since Marsh had provided neither exact measurements of *ceibaensis*, the correct spinal formula nor a description of the connecting lamella of the 4th legs, Kiefer was unable to form a definite opinion as to the synonymy of these species.

A useful diagnostic character in many cyclopoid copepod genera is the shape of the seminal receptacle. Unfortunately Marsh (1919) was unable to see this feature in his material, and it is not visible on any of his specimens. However, the forms of the seminal receptacle reported for different populations of *M. diversus* vary so much (Figs. 12–16) that its value as a diagnostic character in this case is dubious. Fig. 17 shows the shape of the receptacle of a specimen from São Paulo, Brazil, ascribable to *M. ceibaensis*. Dussart and co-workers’ reasons for considering *M. diversus* as distinct from *M. ceibaensis* appear to be the spine for-

Table 2.—Measurements of female specimens from different populations of *Microcyclops ceibaensis*. Abbreviations: CR, caudal ramus; P4, leg 4; enp2, second (terminal) article of endopod; L:W, ratio of length to width. *Indicates measurement made from author's figure.

Record	Total length (mm)	CR L:W	P4 enp2		
			L:W	Terminal spines inner : outer	Length of enp2: inner term. spine
Honduras (1)	—	3.8–5.6:1	2.0–2.35:1	1.56–1.73:1	1.25–1.50:1
Uruguay (2)	0.96–1.0	3.76–4.27:1	2.09–2.43:1	1.26–1.41:1	1.85–1.97:1
Haiti (3)	0.54–0.60	4.0:1	2.38:1	1.61–1.80:1	1.19–1.35:1
Cuba (4)	0.60–0.65	about 5:1	about 3:1	1.6:1*	1.4:1*
Venezuela (5)	0.88	4.5:1	2.2:1	1.4:1	1.9:1
Brazil (6)	0.92	5.2:1	2.97:1	1.44:1	1.44:1
Brazil (7)	0.75–0.76	3.62–3.72:1	2.21–2.31:1	1.52–1.58:1	1.43–1.75:1
Costa Rica (8)	—	3.4:1*	2.0:1*	1.8:1*	1.2:1*

(1) Marsh (1919), measurements presented in this article; (2) Kiefer (1935); (3) Kiefer (1936); (4) Fernando and Smith (1978); (5) Dussart (1984) and specimen from Camaguan, Venezuela; (6) Herbst (1959); (7) 3 specimens from Rio Una do Prelado, State of São Paulo, lent by C. E. F. da Rocha; (8) Collado et al. (1984).

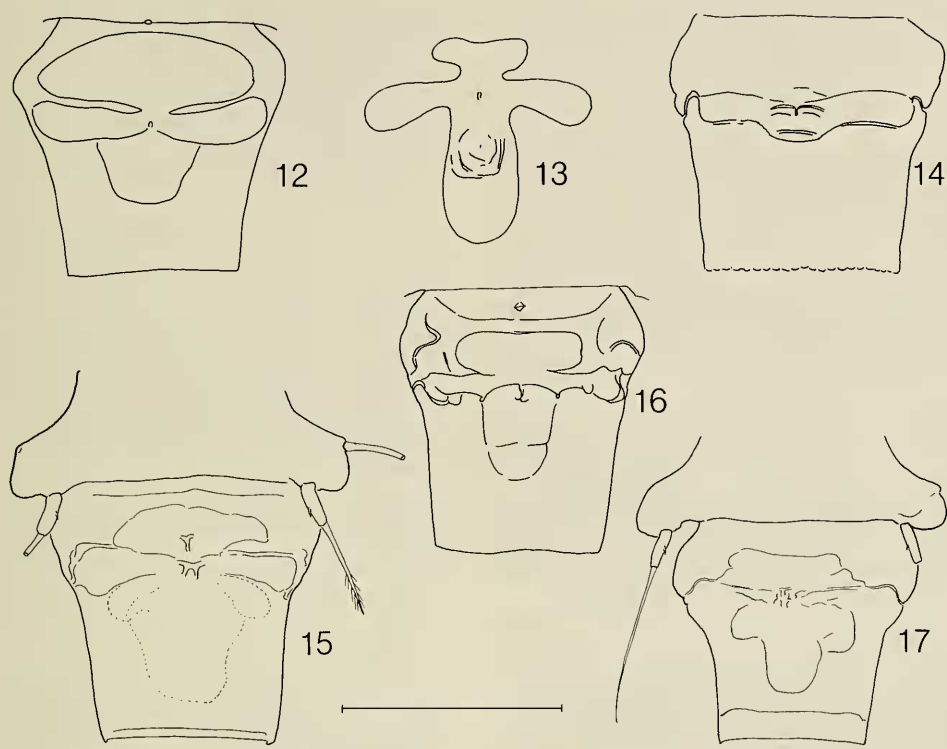
mulae, following Marsh's erroneous description; and the form of the seminal receptacle in specimens from geographically distant populations ascribed either to *M. diversus* (Dussart 1984) or to *M. ceibaensis* (Collado et al., 1984), though they state that the species are "difficult to separate" (Collado et al., 1984). Although the shape of the receptacle is not distinguishable in the present specimens, it is my opinion that the reported variability of this character in these forms is such as to diminish its taxonomic utility. *Microcyclops diversus* should be considered a synonym of *M. ceibaensis*.

Microcyclops ceibaensis as presently defined is at least a very variable species. Its records include freshwater ponds and lakes and one river in Brazil, Costa Rica, Cuba, Haiti, Honduras, Uruguay, and Venezuela. A record by Osorio Tafall (1941) from Lake Pátzcuaro, Mexico, is dubious, since no figures were furnished. Most records seem to be from the littoral zone. Löffler's (1958) characterization of *M. diversus* as a pelagic species in cold polymictic lakes seems based on Harding's record from the Peruvian plateau (Harding 1955); though this may not in fact be *M. ceibaensis*, as discussed below.

B. Notes on some South American records of *Microcyclops* spp.: Harding (1955)

reported that specimens ascribed to *M. diversus* from Peru lacked a spine on the inner extension of basipod article 1 of leg 1. The neotropical species *M. anceps* (Richard, 1897), and its subspecies *M. anceps pauxensis* Herbst, 1962 (= *M. anceps minor* Dussart, 1984); *M. finitimus* Dussart, 1984, known from Venezuela and French Guiana (Dussart 1983); and *M. crassipes* (O. Sars, 1927) from South Africa have also been reported as lacking this spine. However, Harding's fig. 68 clearly shows two rows of spinules on the connecting lamella of the 4th leg, a diagnostic character shared by *M. ceibaensis* and *M. finitimus*. It is possible that Harding's specimens from Lakes Umayo and Arapá refer to the latter species.

Herbst (1959) described a *Cyclops* (*Microcyclops*) *varicans* from the State of São Paulo, Brazil, with two rows of spinules on the leg 4 lamella and leg 4 endopod article 2 2.82–3.24 × longer than wide. *Microcyclops varicans* lacks the former character and the terminal article of leg 4 endopod is shorter (Dussart 1969; Gurney 1933). The placement of the inner spinule of leg 5 of Herbst's specimen "neben der langen Endborste" is similar to *varicans*, but Herbst's specimens are probably referable to *M. finitimus* or to *M. ceibaensis*.



Figs. 12–17. Seminal receptacles of *Microcyclops*: 12–13, *M. diversus*, Uruguay: 12, After Fig. 10 of Kiefer (1935); 13, After Fig. 13 of Kiefer (1935); 14, *M. cf. diversus* and *ceibaensis*, Haiti, after Fig. 68 of Kiefer (1936); 15, *M. diversus*, Camaguan, Venezuela, coll. 13 Oct. 1981, from specimen lent by Dr. B. H. Dussart; 16, *M. ceibaensis*, Costa Rica, after Fig. 28 of Collado et al. (1984); 17, *M. ceibaensis*, Rio Una do Prelado, State of São Paulo, Brazil, coll. 7 June 1984, from specimen lent by Dr. C. E. F. da Rocha. Scale = approximately 100 μ m.

Herbst (1959) also described a *Cyclops* (*Microcyclops*) spec. from São Paulo with caudal rami $5.19 \times$ longer than wide, and remarked on the similarity of this form to *M. diversus*. In view of the reported variation of the length of the caudal ramus in *M. ceibaensis*, Herbst's specimen should be referred to this species.

C. The *Microcyclops varicans* Group in South and Central America: Several species of *Microcyclops* with a spinule at or near the midpoint of the inner surface of leg 5 have been recorded from South and Central America and some Caribbean islands. These include *M. varicans varicans* (Sars, 1863), *M. v. subaequalis* (Kiefer, 1928), *M. elon-*

gatus (Lowndes, 1934), as well as *M. ceibaensis* and *M. finitimus*. As discussed above, *M. finitimus* lacks a spine at the inner corner of basipod 2 of leg 1 and should therefore be considered part of the *M. anceps* group (Dussart 1983, 1984). Both subspecies of *M. varicans* have a relatively short caudal ramus ($3.5\text{--}4.5 \times$ longer than broad), and lack spinules on the connecting lamella of leg 4. *Microcyclops elongatus* is distinguished by its very long caudal rami ($5\text{--}6 \times$ longer than broad); a row of spinules above the lateral seta of the caudal ramus, reaching to the midpoint of the dorsal and ventral surfaces of the ramus; and spinules on the anterior face of the terminal articles of the

endopods of legs 2–4 borne on a “definite scale” (Lowndes 1934).

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